December 1, 2017

Ms. Michelle Kaysen
United States Environmental Protection Agency Region 5
Mail Code LU-9J
77 West Jackson Boulevard
Chicago, Illinois 60604

RE: Response to Agency Comments regarding the *Draft Proposed Multiphase Remedy Framework Remedial Objectives, Remediation Goals, and Performance Metrics, Hartford Petroleum Release Site, Hartford, Illinois*

Dear Ms. Kaysen,

212 Environmental Consulting, LLC on behalf of Apex Oil Company, Inc. (Apex) submitted the *Draft Proposed Multiphase Remedy Framework Remedial Objectives, Remediation Goals, and Performance Metrics, Hartford Petroleum Release Site, Hartford, Illinois* to the United States Environmental Protection Agency (USEPA) and the Illinois Environmental Protection Agency (Illinois EPA) on December 2, 2016. The Illinois EPA provided comments related to the groundwater aspects of the proposed remediation goals, performance metrics, and end-points via correspondence dated February 27, 2017. The USEPA, Illinois EPA, Tetra Tech (USEPA contractor), Apex, and 212 Environmental Consulting, LLC (212 Environmental, Apex contractor) met on Tuesday April 25, 2017 to discuss the Illinois EPA comments.

The USEPA subsequently provided comments regarding the proposed remediation goals, performance metrics, and end-points via email on July 21, 2017. These comments were compiled from those provided by the USEPA RCRA Correction Action Section, Tetra Tech, USEPA Office of Research and Development (ORD), as well as Battelle (the consultant for the USEPA ORD). The Agencies (USEPA and Illinois EPA), Apex, and their respective contractors met on Tuesday September 12, 2017 to discuss the combined USEPA comments.

A response to the Illinois EPA and USEPA comments is provided herein. Apex will submit a revised correspondence including the modifications to the remedial objectives, remediation goals, and performance metrics for the Hartford Petroleum Release Site (Hartford Site) upon reaching concurrence with the USEPA and Illinois EPA regarding each of their comments and Apex's response. The response to comments provided herein is presented in two sections; the first addresses the USEPA comments and the second addresses the Illinois EPA comments.

USEPA COMMENTS

USEPA Comment No. 1 (Title): Modify title to: "*Draft RCRA Corrective Action Framework*" for simplicity of reference; and given that the additional text elements in the current title are implicit content.

> ***Apex Response to USEPA Comment No. 1****:* The use of the terms "*Multiphase Remedy Framework"* was originally proposed by the USEPA in correspondence dated April 14, 2014, which provided a summary of key components that needed to be included within the remedial framework. To be consistent with previous discussions, Apex retained the terms *"Multiphase Remedy Framework"* within the draft correspondence. Apex will revise the title and replace the term "multiphase remedy framework" with the term "RCRA corrective action framework" within the revised correspondence.

USEPA Comment No. 2 (All Document): Replace the phrase "*multiphase remedy framework* " with "*corrective action framework (CAF)*."

> ***Apex Response to USEPA Comment No. 2:*** See response to USEPA Comment No. 1.

USEPA Comment No. 3 (All Document): Replace "*multiphase*" with "*remedial treatment train*" or other similar term to prevent confusion with the multiphase extraction (MPE) remedial technology.

> ***Apex Response to USEPA Comment No. 3****:* The term multiphase will be removed from the revised correspondence to avoid confusion with the term multiphase extraction.

USEPA Comment No. 4 (All Document): Modify text to separate and/or distinguish site and general technical information from the intended main content of the sections: Remediation Goal, Performance Metric, End Points and Measurement Methodology. See "CSM" comments below.

> ***Apex Response to USEPA Comment No. 4:*** The correspondence will be revised to include a background section that will provide information related to the site setting. Information related to the remediation goals, performance metrics, end-points, and measurement methodology will be provided in separate sections of the correspondence.

ORD/Battelle Comment No. 4 (All Document): It is suggested to consider restructuring the framework to better differentiate between ROs and the methods that will be used to achieve them. Performance metrics generally are technology/application specific lines of evidence (e.g., recovery rate, product thickness in wells, soil gas concentrations) that are used to assess progress toward achieving remediation goals. With the exception of RO #1, much of the discussion presented in the

framework in the Performance Metrics section is related to cleanup criteria as opposed to the metrics and measurements that will be used to gauge progress toward achieving the cleanup criteria.

Apex Response to ORD/Battelle Comment No. 4: The draft framework follows the process described by the Interstate Technical and Regulatory Council (ITRC) within their guidance titled *Evaluating LNAPL Remedial Technologies for Achieving Project Goals* (ITRC 2009), as well as the remedial strategy described by the USEPA within their correspondence dated April 14, 2014. As agreed to during the meeting on September 12, 2017 with Apex, USEPA, Illinois EPA, and their technical contractors, there will not be any significant structural changes in the manner in which the objectives, goals, performance metrics, and measurement methods are presented within the revised correspondence or table.

USEPA Comment No. 5 (Page 2, Paragraph 1, Sentence 2): Modify text as follows: "*...with the ITRC Guidance (2009) to '<u>identify potentially viable remedial technologies, as subsequently confirmed viable through</u> '...bench scale and/or pilot testing at the Hartford Site.*"

Apex Response to USEPA Comment No. 5: The text will be revised as requested.

USEPA Comment No. 6, (Page 2, Paragraph 2, Sentence 3): Modify text as follows: "*as a single remedial technology is not likely to be <u>solely effective in remediating</u> the entirety of the Hartford Site (or even any given management area) given the heterogeneity in the hydrogeologic setting and LNAPL source zones.*"

Apex Response to USEPA Comment No. 6: The text will be revised as requested.

ORD/Battelle Comment No. 6 (Page 2, Paragraph 2, Sentence 3): The framework refers to identifying various remediation management areas based on lithology, LNAPL and contaminant of concern (COC) properties, migration pathways, and receptors. It may be the intent to identify these management areas as part of future work (e.g., as part of the engineering alternatives assessment); however, sufficient data should be available to identify and include them in the CSM as part of this framework.

Apex Response to ORD/Battelle Comment No. 6: Apex believes it would be most efficient to focus this correspondence on defining the remediation goals, performance metrics, end-points, and measurement methods that will be incorporated into the remedial framework. The remediation management areas can be proposed within the forthcoming comprehensive conceptual site model. This will allow a meaningful review of all the lines of evidence used to define the remediation management areas.

USEPA Comment No. 7 (Page 2, Paragraph, Sentence 2): Modify text to reflect the recommended revision to current *Remedial Objective No. 2 - Alter Composition of Mobile and Residual LNAPL*.

***Apex Response to USEPA Comment No. 7**:* Please refer to Apex's response to USEPA Comment No. 19.

USEPA Comment No. 8 (Page 2, Paragraph 3, Sentence 3): Modify text as follows: "*These active components of the treatment train remedy will be performed over the near term (#?-#? years) upon approval of this CAF and completion of remedial alternatives analysis.*" Insert range of years in parentheses. Regarding treatment timeframes, it may be beneficial to categorize objectives/goals into, "short, intermediate, and long-term." This concept can be discussed further.

Apex Response to USEPA Comment No. 8: A general timeframe (short, intermediate, or long-term) will be added to Table 1 for each of the agreed remediation goals within the revised correspondence. Please see Apex's Response to ORD/Battelle Comment No. 8 below for additional details.

ORD/Battelle Comment No. 8 (Page 2, Paragraph 3, Sentence 3): In EPA Comment 8, the EPA has requested that an estimate be provided for the number of years that the active portion of the remedy is anticipated to be performed. It is noted that, although a general range could be provided at this time, it will be difficult to estimate a range at this time given that the LNAPL management areas and associated treatment methods have not yet been identified.

Apex Response to ORD/Battelle Comment No. 8: Apex concurs with ORD/Battelle Comment No. 8. The expected timeframe for performing the selected remedial alternative(s) within each remediation management area will be defined after completing the alternatives analysis and selection process. In addition, please see Apex's response to USEPA Comment No. 9

USEPA Comment No. 9 (Page 2, Paragraph 3, Sentence 4): Modify text as follows: "*Once all of the active treatment train remedial technologies have reached predefined end points or asymptotic conditions persist (i.e., diminished ability to reduce mass or concentrations within the LNAPL source zone), site conditions may be determined suitable to a transition to a monitored natural source zone depletion (NSZD) approach.*"

Apex Response to USEPA Comment No. 9: Apex understands that multiple active technologies may be selected to achieve the agreed upon remedial objectives and remediation goals within a remediation management area. Therefore, the text in the first sentence of the third paragraph on Page 2 will be revised to state: "*Some remediation goals may be met over a longer timeframe, after the selected active remedial technologies have achieved reasonable endpoints (e.g., asymptotic recovery, net environmental benefit, etc.).*" In addition, the following sentence will be

inserted after the second sentence, "*It may be necessary in some remediation management areas to employ sequential or parallel active remedial technologies (e.g., air sparging and soil vapor extraction).*". The forth sentence will then be revised to state, "*Once all the selected active remedial technologies for a given remediation management area have reached predefined end-points or asymptotic conditions persist (i.e., diminished ability to reduce mass or concentrations within the LNAPL source zone), site conditions may be determined suitable for a transition to a monitored natural source zone depletion (NSZD) approach.*"

It is possible that the transition from active remediation to natural source zone depletion (NSZD) may proceed at a different timeframe for each remediation management area. Therefore, a sentence will also be added at the end of the third paragraph on Page 2 stating, "*The transition from active remediation to NSZD may proceed at a different timeframe for each remediation management area.*".

ORD/Battelle Comment No. 9 (Page 2, Paragraph 3, Sentence 4): It is suggested that a general discussion of the use of treatment trains be provided. In some LNAPL management areas, treatment trains may consist of an active remedy immediately followed by natural source zone depletion (NSZD). However, in others, it may be necessary to sequentially implement multiple active recovery technologies (e.g., multiphase extraction followed by skimming) prior to transitioning to a passive technology such as NSZD. It is assumed that specific treatment trains for each of the identified LNAPL management areas will be identified as part of the engineering alternatives evaluation mentioned in the framework. As part of that analysis, it will be important to identify appropriate milestones, endpoints, timeframes and contingencies for each part of the proposed treatment train.

Apex Response to ORD/Battelle Comment No. 9: Apex generally agrees with ORD/Battelle Comment No. 9, as summarized in our response to USEPA Comment No. 9. In addition, it is anticipated that milestones, endpoints, anticipated remedial timeframes, and potential triggers for evaluating contingency measures will be defined as part of the alternatives analysis and selection process for each remediation management area.

Remedial Objective No. 1: Reduce Mass of Hydraulically Recoverable LNAPL

USEPA Comment No. 10 (General): Other potential metrics should be discussed and considered for inclusion, including: recovery decline curve analysis for both continuous and pulsed recovery, unit cost per gallon LNAPL recovered, in-well (apparent) LNAPL thickness, etc. Metrics can be tiered and weighted based on a multiple lines of evidence approach. Individual criteria can be further tiered, such as the approach presented by MADEP 2016 in the evaluation of apparent thickness. In light of revisions, it seems performance metric timelines can be further discussed at a later time (frequency of measurements, data needs for trends, etc.).

Apex Response to USEPA Comment No. 10: As stated in the draft correspondence, Apex anticipated that "based on feedback from and discussions with USEPA and Illinois EPA, additional and revised remediation goals and performance metrics may be identified and included in the final framework…". As noted in the ORD/Battelle Comment No. 10, some of these performance metrics suggested by the USEPA, such as recovery decline curve analyses and unit cost per gallon of LNAPL recovered, may be more pertinent to evaluating the progress of specific technologies selected for each remediation management area. However, Apex concurs with the inclusion of apparent LNAPL thickness as an additional performance metric for evaluating Remedial Objective No. 1 and the associated remediation goal, as suggested by the USEPA. The approach suggested by Golder Associates within the *Report on Guidance of Light Non-Aqueous Phase Liquid Mobility for Site Classification Purposes in British Columbia* (Golder Associates 2008) and further described within the Massachusetts Department of Environmental Protection (MADEP) Policy No. WSC-16-450 entitled *Light Non-Aqueous Phase Liquids and the MCP: Guidance for Site Assessment and Closure* (MADEP 2016) provides a reasonable basis for this additional performance metric. Apex proposes to utilize the proposed thresholds for determining if potentially mobile and recoverable LNAPL is present within a monitoring location based on apparent LNAPL thickness and the grain size distribution within the formation as described in Table 2 of the MADEP guidance, but only when the apparent LNAPL thickness is representative of the formation thickness or in other words, when LNAPL is unconfined within a monitoring location. Apparent LNAPL thickness would not be considered when confining or perched conditions were present. Furthermore, apparent LNAPL thickness would only be considered for those locations that are 2-inches in diameter or greater. Apex currently evaluates and reports confined and unconfined LNAPL thicknesses based on quarterly fluid level measurements within routine reports submitted to the USEPA and Illinois EPA on a semiannual basis. This additional line of evidence for evaluating Remedial Objective No. 1 would be useful in: (1) defining where recoverable LNAPL may be present, (2) evaluating progress in reducing the mass of hydraulically recoverable LNAPL, and (3) determining when end-points for LNAPL recovery have been achieved within a remediation management area.

ORD/Battelle Comment No. 10 (General): There are two performance metrics associated with this RG including: 1) reduce LNAPL mass to achieve a transmissivity of 0.1 to 0.8 ft^2/day, and 2) reduce LNAPL saturations to less than 10%. Both metrics serve as lines of evidence for gauging LNAPL mobility and assessing progress toward discontinuing/transitioning recovery activities. However, as noted in comments received from the EPA, a number of other metrics should be considered such as progress toward achieving asymptotic recovery (e.g., decline curve analysis), increase in cost/gallon LNAPL recovered, and changes in LNAPL thicknesses in monitoring wells among others. Incorporation of a general discussion of these metrics is suggested. However, it is understood that specific metrics, milestones, and technology endpoints will be based on the selected technology (or treatment train) applied, the portion of the site where it will be applied, and the risk that will be mitigated.

Apex Response to ORD/Battelle Comment No. 10: Please refer to Apex's response to USEPA Comment No. 11.

USEPA Comment No. 11 (Page 3, Paragraph 2): How the range of Tn values will be applied should be clear. If a particular management area achieves a Tn of 0.1, what will be the decision logic for selecting a higher Tn value as an end point in another management area, for example. Transitioning from hydraulic recovery to residual treatment might require a demonstration of sustained Tn over a period of time without any significant downward trend. Although 0.8 is a recognized upper limit per ITRC, lower values are used elsewhere. MDEQ 2014 has established a value of 0.5: "...if the transmissivity of the NAPL is greater than 0.5 ft^2/day, recovery is beneficial to reduce the saturation and the ability of the NAPL to flow and the NAPL can be recovered in a cost effective and efficient manner."

Apex Response to USEPA Comment No. 11: Two performance metrics were previously identified by Apex for evaluating the progress towards achieving the remediation goal of reducing the mass of hydraulically recoverable LNAPL. It is likely that by reducing LNAPL saturations to below 10% (Performance Metric No. 2) that the resulting LNAPL transmissivity would also be below the target range of 0.1 to 0.8 ft^2/d (Performance Metric No. 1), and vice versa, as was observed during LNAPL recovery testing performed in Area A. Additionally, a third performance metric has been proposed by the USEPA that would further strengthen a multiple lines of evidence approach for evaluating progress towards achieving the remediation goal. In some cases, demonstrating that only one of the performance metrics has been reached will show that this remediation goal has been achieved within a remediation management area. However, in other cases, it may be necessary to consider each of the performance metrics when evaluating progress towards achieving this remedial objective.

It is well understood that measurement of LNAPL transmissivity is highly dependent on the method used and hydraulic conditions present during testing as described by the ORD and Battelle in Comment No. 11. This is certainly the case at the Hartford Site given the significant heterogeneity in lithology and LNAPL occurrence, as well as the variability in hydraulic conditions. Specifying a widely accepted and understood range for the transmissivity end-point provides a starting point for a multiple lines of evidence evaluation in light of the site setting. If it is determined that hydraulic recovery of LNAPL is economically feasible and beneficial within a specific remediation area, but the LNAPL transmissivity is within the range of 0.1 to 0.8 ft^2/day, Apex would rely on additional lines of evidence to determine when Remedial Objective No. 1 has been achieved (such as LNAPL saturation or apparent LNAPL thickness), in concurrence with the USEPA and Illinois EPA.

ORD/Battelle Comment No. 11 (Page 3, Paragraph 2): Transmissivity is dependent on the method used to determine it. For instance, calculating transmissivity using LNAPL and water

recovery rates from a pump and treatment system will yield different values than performing a baildown transmissivity test. The general methods provided in the framework are sufficient for their purpose. However, it is suggested that the specific method that will be used to evaluate transmissivity in each management area should be detailed in future documents.

A transmissivity range of 0.1 to 0.8 ft^2/day, based on widely-accepted ITRC guidance (ITRC 2009), is a good target for preliminary planning purposes. However, transmissivity is site-specific and, depending on site condition, significant LNAPL can be recovered even when the transmissivity is within this range. As an example, Battelle is working at a site at which LNAPL transmissivity (as calculated using the recovery data-based method) falls within this range; however, more than 2,000 gallons/quarter continue to be recovered by the treatment system.

> ***Apex Response to ORD/Battelle Comment No. 11***: Please refer to Apex's response to USEPA Comment No. 11.

USEPA Comment No. 12 (Page 4, Paragraph 2, Bullet 2): Modify text to indicate that both active pumping and ambient (non-pumping) conditions will be evaluated given that a tracer test may be impacted by the induced gradient from the regional production pumping that alters ambient groundwater flow direction.

> ***Apex Response to USEPA Comment No. 12:*** LNAPL transmissivity estimates would not be significantly affected by continuous regional pumping from production wells screened well below the LNAPL smear zone and located thousands of feet to the north of the Hartford Site, irrespective of the method used to measure LNAPL transmissivity including intra-well tracer testing (in which a dye is injected directly into the LNAPL). In the absence of regional pumping, it is anticipated that groundwater elevations would increase within the Main Sand stratum beneath the Hartford Site and LNAPL transmissivity would decrease as additional portions of the smear zone become submerged and water displaces LNAPL within available pore spaces. In the event that regional pumping rates significantly decrease or discontinue, Apex will evaluate apparent LNAPL thicknesses over a range of seasonal conditions and determine if additional LNAPL transmissivity testing is required. A description of the effects of regional pumping on LNAPL transmissivity (and recoverability) will be provided within the revised correspondence.

USEPA Comment No. 13 (Page 4, Paragraph 4, Sentence 1): In general, EPA supports the 10% saturation metric for a decision criteria used to transition from "mobile" to "residual", but additional information is needed. Provide supporting documentation for the selection of <10% saturation and a justification as to why a range of saturation values might not be more appropriate, especially to account for differences between the vadose zone and the saturated units. How will the water table fluctuations and vertical redistribution impact implementation of any given saturation metric? (See

Comment 20. As discussed on 4/25/17, saturation may be an appropriate metric for both a "mobile LNAPL" objective and a "residual LNAPL" objective.)

Apex Response to USEPA Comment No. 13: The proposed end-point for LNAPL saturation of 10% for demonstrating that Remedial Object No. 1 and the association remediation goal have been achieved was cited from MADEP Policy No. WSC-16-450 entitled *Light Non-Aqueous Phase Liquids and the MCP: Guidance for Site Assessment and Closure* (MADEP 2016). The rationale for the LNAPL saturation end-point was originally described in the LSPA Technical Practices Committee Guidance entitled *Massachusetts Contingency Plan Part II* (LPSA 2008). The appropriateness of this end-point at the Hartford Site was demonstrated via saturation estimates and LNAPL recovery data collected during LNAPL recovery pilot testing performed in Area A of the Hartford Site between 2011 and 2014.

As described in Apex's Response to USEPA Comment No. 11, in some cases, demonstrating that only one of the performance metrics has reached its end-point (such as LNAPL saturations below 10%) might indicate that the remedial objective has been achieved within a remediation management area. However, in other cases, it may be necessary to consider each of the performance metrics (including LNAPL saturation, transmissivity, and apparent LNAPL thickness) using a multiple lines of evidence approach to demonstrate that the remedial objective has been achieved.

As agreed to during the meeting on September 12, 2017 with Apex, USEPA, Illinois EPA, and their technical contractors, LNAPL saturation will not be considered as an additional performance metric for any of the remaining remedial objectives. However, an additional remedial objective and associated goals, performance metrics, and measurement methods will be added to the revised correspondence and table to address the potential for direct exposure to petroleum hydrocarbons in soil, where historical data and information indicate that surface and shallow subsurface releases might be present within a remediation management area. The additional remedial objective (Remedial Objective No. 6) will evaluate the direct exposure pathway for both residential and construction worker scenarios in accordance with applicable USEPA guidance including but not limited to the *Soil Screening Guidance* (USEPA 1996) and *Supplemental Soil Guidance for Developing Soil Screening Levels for Superfund Sites* (USEPA 2002).

ORD/Battelle Comment No. 13 (Page 4, Paragraph 4, Sentence 1): Soil and LNAPL type have a significant impact on degree of saturation and mobility. Although a final LNAPL saturation of 10% may be protective of human health and the environment, this has not been demonstrated at this site. Saturation should be reduced to a level that will mitigate site risks and achieve the desired ROs. For example, shallow LNAPL comprised mostly of benzene could result in a complete VI pathway even at a saturation of 10%. Conversely, deeper or more weathered LNAPL (e.g., diesel) may not result in a completed VI intrusion pathway at much higher saturations. (*Though EPA R5 agrees with the premise*

of the comment, it appears to be weighing saturation purely as an endpoint rather than a component of a treatment train and remedial transition.)

Apex Response to ORD/Battelle Comment No. 13: LNAPL saturation has been proposed as a performance metric for evaluating the remedial objective and remediation goal of reducing the mass of hydraulically recoverable LNAPL beneath the Hartford Site. This performance metric was not suggested to be proposed as a performance metric for any of the other remedial objectives or remediation goals. The other remedial objectives and remediation goals, as well as the associated performance metrics address specific risks (e.g., inhalation or ingestion) to potential receptors in Hartford. It is anticipated that each of the remedial objectives and remediation goals would be achieved before corrective action is considered to be "complete" within a remedial management area. It is not clear how operating remedial alternatives targeting hydraulically recoverable LNAPL beyond recovery end-points might reduce potential risks to receptors. In these cases, additional alternatives targeting residual LNAPL (e.g., vapor extraction, in-situ chemical oxidation,) might be more effective at reducing risks over time. The objectives, goals, and metrics that are being targeted by a specific technology in a specific remediation management area will be defined as part of the alternatives analysis process.

USEPA Comment No. 14 (Page 4, Paragraph 5, Sentence 3): See Comment 13. MADEP 2016 also acknowledges uncertainties associated with the generation of a single residual saturation value. As stated by various sources, residual saturation is directly proportional to initial LNAPL saturation. MADEP states that literature values for residual saturation often over-estimate values seen at typical sites because those literature values originate from larger oilfield releases. By comparison, the releases at Hartford may be more comparable to those larger, high-volume/high-pressure releases.

Apex Response to USEPA Comment No. 14: Apex understands that residual saturation limits are dependent on soil and LNAPL properties, and proportional to initial saturations at the time of the release. As described in the draft correspondence, "*LNAPL saturation within Area A (both historical and recent measurements collected as part of the Area A Additional LNAPL Recovery Pilot Test) ranged from 1.7 – 7.1%, with an average of 4.9% across the smear zone in the Main Sand stratum. Even under extreme groundwater depression achieved via focused pumping at over 300 gallons per minute, during an already seasonally low water table, LNAPL was not observed to be mobile or potentially recoverable (Trihydro 2015).*" Similar to the use of LNAPL transmissivity as an end-point (described in Apex's response to Comment No. 11), if it is determined that hydraulic recovery of LNAPL is economically feasible and beneficial within a specific remediation area, but the LNAPL saturation is measured below 10%, Apex would rely on additional lines of evidence to determine when the remedial objective has been achieved (such as LNAPL transmissivity or apparent LNAPL thickness), in concurrence with the Agencies.

USEPA Comment No. 15 (Page 4, Paragraph 5, Sentence 5): Site specific technology testing and metric measurement doesn't seem appropriate for inclusion within this document, but rather a technology evaluation.

Apex Response to USEPA Comment No. 15: The sentence describing LNAPL recovery during the Additional LNAPL Recovery Pilot Test was not intended to assess a specific technology (e.g., focused pumping) but was intended to demonstrate the appropriateness of using a saturation limit of 10% for potentially mobile and recoverable LNAPL.

USEPA Comment No. 16 (Page 5, Paragraph 1, Bullet 1, Sentence 2): LNAPL saturation values to demonstrating the transition from "mobile" to "residual" technologies may need to be measured in more than one way. The document text currently states "one" of the presented methods (though Table 1 states "one or more", clarify). Undisturbed soil cores are reportedly difficult to obtain *below the top of the water table*. Can this be overcome through measurement methods, equipment, water draw-down, etc.? Would it be advantageous to utilize separate/multiple methods for the vadose zone versus the saturated unit?

Apex Response to USEPA Comment No. 16: It is envisioned that LNAPL saturations may be estimated using one of the three methods described in the draft correspondence and summary table, while selection of the most suitable method may be dependent upon the lithology, hydraulic conditions, and smear zone distribution within each remediation management area. Apex has previously calculated LNAPL saturations based on total petroleum hydrocarbon analytical results measured in soil samples collected as part of the Additional LNAPL Recovery Pilot Test in Area A. This method, as well as measuring LNAPL saturations using in-situ cryogenically frozen soil cores, potentially overcomes limitations with measuring LNAPL saturation from undisturbed cores collected below the water table.

USEPA Comment No. 17 (Page 5, Paragraph 1, Bullet 2, Title): Modify bullet title as follows: "*Calculate LNAPL saturations based on Total Petroleum Hydrocarbon Analytical Results and Soil Geotechnical Characteristics*."

Apex Response to USEPA Comment No. 17: This sentence will be modified as requested.

USEPA Comment No. 18 (Page 5, Paragraph 2): Modify text as follows: "*As the hydrogeologic setting and LNAPL releases are known to be highly heterogeneous, statistical methods may be employed when evaluating LNAPL saturations using the above soil sampling and analytical methods*."

Apex Response to USEPA Comment No. 18: This sentence will be modified as requested.

USEPA Comment No. 19 (General): Consider the addition of a remedial objective between No. 1 and No. 2 (possibly a sub-category for hydraulically recoverable LNAPL) termed, "Identify mass available for hydraulic recovery through enhanced mass recovery." The corresponding Remediation Goal might be, "Enhance mass of hydraulically recoverable LNAPL to drive project lifecycle forward." Performance metrics and endpoints would likely mirror those already mentioned; however, this objective could be useful in achieving the lower Tn range over a full range of site hydrogeologic conditions.

Apex Response to USEPA Comment No. 19: As agreed to during the meeting on September 12, 2017 with Apex, USEPA, Illinois EPA, and their technical contractors, a remedial objective entitled "Enhance Mass of Hydraulically Recoverable LNAPL to Drive Project Lifecycle Forward" will not be added to the revised correspondence. Apex understands concerns that failure to remove potentially recoverable LNAPL could extend the timeframe for achieving the end-points for each of the Remedial Objectives, as discussed during the September 12, 2017. However, it should be noted that significant delays in achieving end-points would result in increased costs for Apex in operating remedial and mitigation systems, as well as continued routine monitoring at the Hartford Site.

Remedial Objective No. 2: Alter Composition of Mobile and Residual LNAPL

USEPA Comment No. 20 (Page 5, Remedial Objective, No. 2, Title): Modify Remedial Objective No. 2 to: "Reduce Residual LNAPL Source Mass". Explain the application of a 'treatment train' strategy, wherein mass would be removed using a series of technologies to maximize mass removal volume.

Apex Response to USEPA Comment No. 20: As agreed to during the meeting on September 12, 2017 with Apex, USEPA, Illinois EPA, and their technical contractors, Remedial Objective No. 2 will not be modified within the revised correspondence. As discussed during the meeting, the remedy should target residual LNAPL in the smear zone that poses a risk to receptors (e.g., inhalation, ingestion, direct contact). It has been demonstrated in numerous studies and incorporated in numerous remedies (including those remedies implemented under RCRA within USEPA Region 5) that NSZD processes will effectively reduce LNAPL saturations over time in cases where residual LNAPL no longer poses a risk to potential receptors.

USEPA Comment No. 21 (Page 5, Paragraph 3, Sentence 1): Move current remediation goal text to "Remedial Objective No. 3: Protect Village of Hartford Residents from Risks Associated with a Completed Vapor Intrusion Pathway ", or other objective, as applicable to final set of revisions. Change Remediation Goal to "Reduce mass of residual LNAPL using various remedial technologies selected as part of future engineering alternatives analysis". Explain the further application of a 'treatment train' strategy.

Apex Response to USEPA Comment No. 21: Please see Apex's response to USEPA Comment No. 20.

ORD/Battelle Comment No. 21 (Page 5, Paragraph 3, Sentence 1): It is suggested that this RO should be incorporated as part of one or more RGs required to achieve the other stated ROs. As noted in the comments received from the EPA, this proposed RO is actually a method used to achieve an objective. Battelle concurs with EPA's comment that the objective should be moved to RO 3 (and 4 and 5 as applicable). However, Battelle does not concur with the EPA that this RO should be modified to "Reduce mass of residual LNAPL using various remedial technologies selected as part of future engineering alternatives analysis". By the same line of reasoning, it is suggested that this stated objective also be incorporated as part of the RGs for ROs 3, 4, and 5 below as necessary. As part of the same comment, EPA suggests adding a secondary goal to include the reduction of residual LNAPL to appropriate risk-based soil direct contact criteria. However, if direct contact with contaminated soil is an anticipated exposure pathway, then an additional RO stated as "Prevent direct human contact with soils" should be considered. A relevant RG would be to reduce concentrations of residual hydrocarbons to an established risk-based value. (ORD comment included for discussion purposes. EPA R5 still recommends the use of "reduce mass of residual LNAPL..." as a remediation goal. See Comment 22 regarding soil direct contact.)

Apex Response to ORD/Battelle Comment No. 21: As agreed to during the meeting on September 12, 2017 with Apex, USEPA, Illinois EPA, and their technical contractors, there will not be any significant structural changes in the manner in which the objectives, goals, performance metrics, and measurement methods are presented within the revised correspondence or table.

However, as recommended by the ORD and Battelle, and further discussed at the meeting, an additional remedial objective and associated goals, performance metrics, and measurement methods will be added to the revised correspondence and table to address the potential for direct exposure to petroleum hydrocarbons in soil, where historical data and information indicate that surface and shallow subsurface releases might be present within a remediation management area. The additional remedial objective (Remedial Objective No. 6) will evaluate the direct exposure pathway (i.e., ingestion, dermal, and inhalation pathways) in accordance with applicable USEPA guidance including but not limited to the *Soil Screening Guidance* (USEPA 1996) and *Supplemental Soil Guidance for Developing Soil Screening Levels for Superfund Sites* (USEPA 2002). This will include evaluation of residential exposure to surface soil, defined as 0 to 3 ft-bgs, and construction worker exposure to shallow subsurface soil, defined as 3 to 10 ft-bgs. Only areas that have documented releases between 0 and 10 ft-bgs will be considered as part of this remedial objective, unless it is documented that existing utilities are present deeper than 10 ft-bgs within a remedial management area.

USEPA Comment No. 22 (Page 5, Paragraph 4, Sentence 1): Delete "*Performance metrics and measurement methods used for evaluating the vapor intrusion pathway are described under Remedial Objective No. 3.*" Insert proposed metric(s) and measurement methodology(s) to support new Remediation Goal. If the goal is to reduce the mass of residual LNAPL, the appropriate metrics might include: decrease in saturation profile, soil concentration trends, LIF comparisons, apparent thickness trends or tiered analysis, etc. A secondary goal and/or metric should include the reduction of residual LNAPL to appropriate risk-based soil direct contact criteria.

Apex Response to USEPA Comment No. 22: Please see Apex's response to USEPA Comment No. 20.

Remedial Objective No. 3: Protect Village of Hartford Residents from Risks Associated with Completed Vapor Intrusion Pathway

USEPA Comment No. 23 (General): Consider reorganizing the current proposed objectives 2-4. Remedial Objective No. 3 could be "alter composition of any remaining LNAPL." Sub-categories, or split goals, could then capture the elimination of the VI pathway and restoration of groundwater. The goal of the objective to "alter composition" would be the "elimination of COC partitioning to either the vapor or dissolved phase".

Apex Response to USEPA Comment No. 23: As agreed to during the meeting on September 12, 2017 with Apex, USEPA, Illinois EPA, and their technical contractors, there will not be any significant structural changes in the manner in which the objectives, goals, performance metrics, and measurement methods are presented within the revised correspondence or table.

USEPA Comment No. 24 (Page 6, Paragraph 3, Sentence 1): Modify Remedial Objective No. 3 to "Site-Wide Elimination of Vapor Intrusion Pathway"**.** Clarify that the CAF does not include Emergency Response and provide references for the relevant regulatory and site-specific emergency action requirements and related response work plans.

Apex Response to USEPA Comment No. 24: Each of the remedial objectives will be applied to all portions of the Hartford Site but achieving each objective may proceed at a different rate within each remediation management area. As such the USEPA request to revise the title of Remedial Objective No. 3 seems unnecessary. However, the correspondence will be revised to indicate that Remedial Objective No. 3 does not include assessing or conducting emergency response activities, as are currently being performed by Apex as described in the *Final Interim In-Home Effectiveness Monitoring Work Plan* (Trihydro 2014). The following text will be inserted after the first sentence of the third paragraph on Page 6: "*The corrective action framework does not include evaluation of acute risks including explosive conditions or acute inhalation hazards*

associated with the vapor intrusion pathway. Assessment of the vapor intrusion pathway and performing emergency response activities when action levels and comparison values are exceeded within indoor air will continue to be conducted in accordance with the Final Interim In-Home Effectiveness Monitoring Work Plan (Trihydro 2014)."

USEPA Comment No. 25 (Page 6, Paragraph 4, Sentences 2 and 3): Replace "*Soil vapor and ambient air samples* " with "*Indoor air, outdoor (ambient) air, sub-slab soil vapor, and soil vapor from monitoring probe samples….*" Provide rationale for using a Hazard Quotient of 1.0; for example, the site constituents of concern (COC) toluene and xylene both target the nervous system and thus have Hazard Quotients of 0.5. Clarify that an attenuation factor will only be used in the absence of indoor air data.

Apex Response to USEPA Comment No. 25: The second sentence will be revised as requested. In addition, the text will be modified to indicate that the constituents of concern will be evaluated and grouped by target organ for noncarcinogenic effects to account for constituents that have the same target organ or mode of action. The following text will be inserted following the third sentence of the fourth paragraph on Page 6: "*For noncarcinogenic constituents, the risk-based screening values will be adjusted to account for instances where two or more contaminants of concern have the same target organ or mode of action (i.e., they are similarly acting chemicals) using the Illinois Pollution Control Board mixture rule. The Illinois Pollution Control Board finalized the mixture rule by adopting Dockets B and C, which amended the TACO regulations (35 Illinois Administrative Code Part 742). To apply this rule, the risk-based screening values for each constituent will be divided by the number of constituents of concern that have the same target organ as a conservative measure to ensure that the combined noncarcinogenic risk from those compounds does not exceed a hazard index of 1. For example, if there are three COCs with the same target organ, the risk-based screening levels for those constituents will be divided by 3.*"

The third sentence of the fourth paragraph of Page 6 regarding the use of an attenuation factor will remain as originally stated. As discussed within the text in the first paragraph of Page 7, volatile constituents are ubiquitous in indoor and outdoor air from a variety of alternate sources including but not limited to automobiles, gasoline powered tools, water treatment chemicals, building materials (carpets, upholstery, etc.), cleaning products, insecticides, glues, and other consumer products. The presence of alternate sources complicates evaluation of the vapor intrusion pathway. To separate volatile petroleum related constituents attributed to alternate source from those related to LNAPL at depth, it is recommended by the USEPA (2015) along with other numerous state and industry guidance documents that a multiple lines of evidence approach be used to evaluate completeness of the vapor intrusion pathway. This includes the collection of indoor air, outdoor air, sub-slab, and soil vapor samples and evaluating the data relative to the concentration and relative proportions of constituents of concern within each of the samples. As discussed in the response to USEPA Comment No. 28, the USEPA (2012, 2015)

recommends the use of an attenuation factor to identify volatile constituents that may be attributed to alternate sources from those that have migrated from LNAPL sources in the subsurface. Future pathway evaluations will include assessing attenuation rates of constituents from the sub-surface into indoor air, as part of a multiple lines of evidence approach. An additional discussion regarding attenuation factors is provided in the Apex's response to USEPA Comment No. 28.

USEPA Comment No. 26 (Page 6, Paragraph 1, Sentences 2 and 3): This portion of Remediation Goal No. 2 and proposed Objective No. 4, effectively asserts that shallow groundwater is not hydraulically connected to the groundwater in the Main Sand. Given the high degree of heterogeneity at the site, and the transient nature of water levels in the shallow groundwater, it is assumed that communication exists between the shallow and deeper water bearing zones. Additional data are required to demonstrate that site conditions accordingly warrant application of different clean-up criteria. EPA GW guidance evaluates whether or not the shallow units are "usable" (RCRA GW handbook, PDF pg 40). The deep units are certainly usable in that the GW in those units are pumped to the public water supply. However, GW is also acknowledged as usable when it replenishes adjacent aquifers. Since there is a clear hydraulic connection between the shallow and deep units at Hartford, the shallow units appear categorically "usable". The EPA 1988 GW Classification guidance (PDF pg. 39) says that when waters within a groundwater unit are inferred to be highly interconnected a common use and value can be determined. This information suggests we should use MCLs in all units because they are all interconnected and the upper units replenish the lower units. EPA's GW Handbook also provides methods for applying risk-based criteria. As discussed on 4/25/17, it may be necessary to explore the value added of risk-based criteria in the shallow units.

Apex Response to USEPA Comment No. 26: Apex will clarify the interconnectedness between the shallow perched hydrostratigraphic units (North Olive and Rand strata) and the deeper, more extensive hydrostratigraphic units (Main Sand stratum) within the background section of the revised correspondence. As noted in the USEPA Comment No. 34, the third and fourth paragraph on Page 8 of the draft correspondence described the interconnectedness of the various hydrostratigraphic units. While it is understood migration of perched groundwater can lead to dissolved phase flux from the overlying shallow units into the deeper hydrostratigraphic units, there are several lines of evidence including evaluation of upward vertical gradients within co-located monitoring wells screened across the Main Sand stratum indicating that petroleum related constituents are also migrating from the Main Sand stratum into the perched hydrostratigraphic units. Within the draft correspondence, Apex proposed that risk based end-points would be developed to demonstrate that Remediation Goal No. 2 listed under Remedial Objectives No. 2 and No. 4 for the shallow perched units, assuming that the groundwater in the perched units was "not viable as a potable resource". As agreed to during the meeting on September 12, 2017, the end-point will be revised to state that an evaluation of the dissolved

phase groundwater remediation objectives will be conducted within each groundwater management area in accordance with the Illinois EPA Tiered Approach to Corrective Action Objectives (35 Illinois Admin. Code Part 742). This evaluation will consider the pathway for dissolved phase migration, potential routes of exposure including direct ingestion, and determination of risk based concentration limits for each remedial management area.

ORD/Battelle Comment No. 26 (Page 6, Paragraph 1, Sentences 2 and 3): As noted in EPA comments, it may not be appropriate to consider the shallow perched groundwater as a non-potable groundwater source. Include statements that mass reduction and phase change technologies will be evaluated and implemented as appropriate to achieve this goal. Specific approaches for each LNAPL management area will be determined as part of the engineering alternative assessment. Technology specific performance metrics (lines of evidence), milestones, and measurement techniques will be identified at that time.

Apex Response to ORD/Battelle Comment No. 26: Please refer to Apex's response to USEPA Comment No. 26. Additional information regarding the selection and implementation of alternatives to achieve mass reduction and alteration of the physical and chemical composition of LNAPL for each remediation management area will be added to the introductory section of the revised correspondence. This information was provided within the Path Forward section on Page 12 and 13 of the draft correspondence.

USEPA Comment No. 27 (Page 6, Paragraph 5, Sentences 2 and 3): Modify sentence as follows: *"Indoor air, outdoor (ambient) air, sub-slab soil vapor and soil vapor from monitoring probe samples will be collected from representative locations."* Clarify what "*representative locations* " means in the context of distance from dwellings, depth below ground surface, weather conditions, river stage, proximity to operating soil vapor extraction systems, and other conditions that could potentially affect the data.

Apex Response to USEPA Comment No. 27: The text will be revised as requested. Additional text will be added after the first sentence of the fifth paragraph on Page 6 to clarify the meaning of "representative locations" as follows: "*Representative structures will be selected above the extent of LNAPL within each remediation management area, focusing on those structures with a basement that have historically had a completed vapor intrusion pathway. Soil vapor samples may also be collected from existing vapor monitoring probes located closest to the representative structures but outside of the influence of nearby operating soil vapor extraction wells. Monitoring within the representative structures will be conducted over a range of hydraulic (e.g., seasonally low water table, river stage trigger event) and seasonal (e.g., cold ambient air temperature, frozen ground) conditions to assess variability in vapor transport processes.*".

USEPA Comment No. 28 (Page 7, Paragraph 2, Sentence 1): Modify sentence as follows: "*The vapor intrusion pathway cannot be considered complete unless volatile constituents are measured at equivalent or higher concentrations beneath the building compared to indoor air.*"

Apex Response to USEPA Comment No. 28: The suggested text revision suggests that similar concentrations within the indoor air and sub-slab soil vapor would be indicative of a completed vapor intrusion pathway, which is inconsistent with USEPA guidance and industry best practices. Volatile petroleum hydrocarbons are ubiquitous in indoor and outdoor air from a variety of alternate sources including but not limited to automobiles, gasoline powered tools, smoking, building products (carpets, upholstery, etc.), cleaning products, insecticides, glues, and other consumer products. Natural gas leaks have been routinely detected in structures in Hartford. There is connectivity between indoor and outdoor air and shallow soil vapor due to changes in atmospheric pressure (referred to as barometric pumping). This connectivity can result in volatile petroleum hydrocarbons attributed to alternate sources migrating into shallow soil vapor (including immediately beneath a building slab) due to barometric pumping. As described in the USEPA guidance titled *Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air* dated June 2015, "sub-slab soil vapor concentrations can be expected to typically exceed indoor air concentrations by 33 times, or more, in residences that are impacted by vapor intrusion (equivalent to an attenuation factor of 0.03), when background sources are negligible and the building is under-pressurized relative to the subsurface." Significantly, higher rates of attenuation have been observed between sub-slab soil vapor and indoor air within structures with a completed pathway at the Hartford Site. The USEPA recommends a conservative attenuation factor of 0.03 (including deeper soil vapor and sub-slab soil vapor), which represents the 95% upper confidence level for attenuation observed within thousands of buildings with a completed vapor intrusion pathway (USEPA 2012).

USEPA Comment No. 29 (Page 7, Paragraph 2, Sentence 3): Clarify that an attenuation factor will only be used in the absence of indoor air data.

Apex Response to USEPA Comment No. 29*:* Please refer to Apex's response to USEPA Comment No. 25.

USEPA Comment No. 30 (Page 7, Paragraph 2, Sentences 5 and 6): Delete discussion of chlorinated solvents as the basis for use of an air attenuation factor of 0.03. Alternatively, clarify that their inclusion is for context only, based on comparison with the physiochemical properties of petroleum hydrocarbon constituents, and that the tetrachloroethene and trichloroethene are not site COCs.

Apex Response to USEPA Comment No. 30: The purpose of the referenced text is to provide information for understanding that the attenuation factors provided by the USEPA are based

primarily on sites with chlorinated solvent impacts and do not account for aerobic biodegradation at petroleum hydrocarbon sites. As suggested, the text will be modified as follows starting with the fifth sentence of the second paragraph of Page 7: "*The soil vapor to indoor air attenuation factor (including deeper soil vapor and sub-slab soil vapor) has been conservatively estimated at 0.03 (95% upper confidence interval, USEPA 2012) based on evaluations of the vapor intrusion pathway at structures where the pathway has been determined to be complete. The data set used by the USEPA is based on evaluation of concentrations of chlorinated volatile constituents (i.e., tetrachloroethene and trichloroethene) in and underneath residential buildings. There is limited data regarding attenuation from soil vapor to indoor air within structures underlain by petroleum hydrocarbons, as aerobic biodegradation of volatile petroleum constituents in the vadose zone is a significant mechanism for limiting vapor transport into structures (ITRC 2014). Therefore, the USEPA recommended attenuation factor of 0.03 is conservative for assessment of the vapor intrusion pathway at the Hartford Site, as it does not account for attenuation occurring due to aerobic biodegradation of volatile petroleum hydrocarbons in the vadose zone. Multiple lines of evidence will be considered to determine if the vapor intrusion pathway is complete and to determine if there are potential inhalation risks associated with migration of volatile constituents from petroleum hydrocarbon sources located in the subsurface.*".

Remedial Objective No. 4: Restore Groundwater to Practicable Beneficial Reuses

USEPA Comment No. 31 (Page 7, Paragraph 3, Sentence 1): See Comment 22.

Apex Response to USEPA Comment No. 31: Please see Apex's response to USEPA Comment No. 20.

USEPA Comment No. 32 (Page 8, Paragraph 2, Sentences 1 and 2): Specify the "*select dissolved phase constituents* ". Clarify that if samples can't be collected due to the presence of LNAPL, the applicable treatment train Performance Metric would be applied.

Apex Response to USEPA Comment No. 32: The current dissolved phase constituents of concern for the Hartford Site are benzene, toluene, ethylbenzene, xylene, lead, and arsenic. If LNAPL is present in a well, then Remedial Objective No. 4 would not be achieved within a groundwater management area. Dissolved phase concentrations in this case, would be considered equivalent to the effective solubility limit for the LNAPL source. Each of the remediation objectives would need to be achieved before RCRA corrective action within a management area could be considered complete.

USEPA Comment No. 33 (Page 8, Paragraph 2, Sentence 3): Confirm what is of concern in detecting low concentrations of dissolved phase constituents in the perched hydrostatic units when LNAPL or a sheen is observed in a given monitoring well.

Apex Response to USEPA Comment No. 33: The analytical results for groundwater samples collected when the screen is occluded generally exhibit a low bias (or diluted results for dissolved phase constituents). The analytical results for groundwater samples collected when LNAPL is present generally exhibit a high bias due to the presence entrained non-dissolved petroleum hydrocarbons (Zemo 2006). Paragraph 2 on Page 8 will be revised accordingly.

USEPA Comment No. 34 (Page 8, Paragraphs 3 and 4): These two paragraphs seem more like conceptual site model (CSM) descriptions versus being germane to measurement methodology. If they are important to the measurement methods, provide clarifications as to why. Otherwise, consider moving these paragraphs to immediately follow the section title ("Remediation Goal # 1") as a new subsection ("Current Conditions"). Also, consider providing a map that shows their distribution and how that relates to methods. As it pertains to the groundwater end points, these two paragraphs provide confirmation that the shallow units are in communication with the deeper units. For clarity and completeness, it should be added that the groundwater from the North Olive and Rand strata drain into the Main Sand, which makes up the American Bottoms Aquifer.

Apex Response to USEPA Comment No. 34: As described in Apex's response to USEPA Comment No. 4, the correspondence will be revised to include a background section that will provide information related to the site setting. Information related to the remediation goals, performance metrics, end-points, and measurement methodology will be provided in separate sections of the correspondence. Figures showing the extent of the North Olive and Rand strata have been provided in previous documents and will be included in the forthcoming comprehensive conceptual site model. A reference to the most recent report incorporating these figures will be provided in the revised correspondence. Please refer to Apex's response to USEPA Comment No. 26 regarding the nature of connectivity between the shallow perched zones (e.g., North Olive and Rand strata and the deeper hydrostratigraphic units (e.g., Main Sand stratum).

USEPA Comment No. 35 (Page 8, Paragraph 6, Sentence 1): Modify sentence as follows: *"Groundwater within the deep portions of the Main Sand stratum are utilized as a drinking water resource, approximately 600 feet to the southwest of the currently known extent of petroleum hydrocarbons attributed to historical releases from the refineries and petroleum storage facilities."*

Apex Response to USEPA Comment No. 35: The sentence will be revised to state that: *"Groundwater within the deep portions of the Main Sand stratum are utilized as a drinking water resource, more than 1,700 feet (well beyond the 1,000-foot maximum setback zone) to the southwest of the currently known extent of petroleum hydrocarbons attributed to historical releases*

from the refineries and petroleum storage facilities." The correction in the text is based on the distance from the edge of the dissolved phase plume to the production wells (WSW-3 and WSW-4) that are currently maintained by the Village of Hartford. Production wells WSW-1 and WSW-2 were previously abandoned by the Village of Hartford as reported by the Illinois EPA during the April 25, 2017 meeting and subsequently verified by the Village of Hartford on September 13, 2017.

USEPA Comment No. 36 (Page 9, Paragraph 3): These two paragraphs seem more like a CSM description versus being germane to measurement methodology. If they are important to the measurement methods, provide clarifications as to why. Otherwise, consider moving these paragraphs to immediately follow the section title ("Remediation Goal # 2") as a new subsection ("Current Conditions"). Also consider providing a map that shows their distribution and how that relates to methods.

***Apex Response to USEPA Comment No. 36**:* As described in Apex's response to USEPA Comment No. 4, the correspondence will be revised to include a background section that will provide information related to the site setting. Information related to the remediation goals, performance metrics, end-points, and measurement methodology will be provided in separate sections of the correspondence. Figures showing groundwater elevations and flow within the Main Sand stratum have been provided in previous documents and will be included in the forthcoming comprehensive conceptual site model. A reference to the most recent report incorporating these figures will be provided in the revised correspondence.

Remedial Objective No. 5: Protect Against Dissolved Phase Constituent Migration to the Village of Hartford Drinking Water Well Field

USEPA Comment No. 37 (Page 9, Paragraph 4, Sentence 1): Modify goal to reflect that corrective action completion must be based on ambient (non-pumping) conditions.

***Apex Response to USEPA Comment No. 37**:* The natural groundwater flow regime in the Main Sand stratum has been altered beneath the Hartford Site primarily due to pumping on the British Petroleum (approximately 1,225 gallons per minute) and Phillips 66 (more than 6,000 gallons per minute along the river dock and 3,000 gallons per minute on the refinery) facilities. Apex does not have operational control of pumping being performed on these facilities and cannot ensure that groundwater monitoring can be performed under ambient (non-pumping conditions). Considering this limitation, Apex will perform modeling of the dissolved phase constituent flux under ambient (non-pumping) and stressed (pumping) conditions using MODFLOW, Bioscreen, or comparable software to determine if Remedial Objective No. 5 has been achieved following implementation of alternatives in a remedial management area, prior to corrective action being considered complete. The model can be calibrated using site groundwater data collected

routinely from the sentinel monitoring wells and other monitoring wells and multipurpose monitoring points installed across the Hartford Site. The model selected will account for attenuation of petroleum hydrocarbons along the migration pathway both vertically and laterally away from the source zone. However, if the production wells on the British Petroleum and Phillips 66 facilities are not operating and ambient conditions are present within the Main Sand stratum prior to completion of the selected remedial alternatives, Apex will collect the groundwater data directly from the sentinel and other monitoring locations to demonstrate that Remedial Objective No. 5 has been achieved.

ORD/Battelle Comment No. 37 (Page 9, Paragraph 4, Sentence 1): Consider rewriting the RG as "Protect the Village of Hartford drinking water well field from the migration of dissolved phase petroleum hydrocarbons attributed to historical releases from the Hartford site". The two options should be eliminated. Option number 1 is a remedial alternative – containment by pumping. Option number 2 is a performance metric (cleanup criteria) and should be discussed as such. A general discussion of how source reduction and phase-change activities will help to protect against dissolved phase constituent migration should be included. As noted by the EPA, corrective action completion should be based on ambient conditions. Transport modeling using MODFLOW or comparable software may be performed under both pumping and non-pumping conditions to better understand impacts on groundwater flow and contaminant transport. The model can be calibrated and updated at regular intervals using site data.

Apex Response to ORD/Battelle Comment No. 37: The remediation goal will be revised as requested and the first performance metric will be removed. The second performance metric will be retained and a general discussion regarding how source reduction and changes in the physical and chemical composition of the LNAPL will affect dissolved phase flux will be added to the revised correspondence. As noted in Apex's response to USEPA Comment No. 37, if stressed conditions (pumping) are present within the Main Sand stratum upon completion of the remedial alternatives, modeling of dissolved phase constituent flux under ambient (non-pumping) and stressed (pumping) conditions using MODFLOW, Bioscreen, or comparable software will be performed within a groundwater management area to demonstrate that Remedial Objective No. 5 has been achieved.

USEPA Comment No. 38 (Page 10, Paragraph 3, Sentences 2 through 7): This paragraph seems more like a CSM description versus being germane to measurement methodology. If they are important to the measurement methods, provide clarifications as to why. Otherwise, consider moving these paragraphs to immediately follow the section title ("Remediation Goal # 2") as a new subsection ("Current Conditions"). Also consider providing a map that shows their distribution and how that relates to methods. The last sentence should be revised to state, "...groundwater depression and sustained hydraulic gradients" are not always present...

Apex Response to USEPA Comment No. 38*:* As described in Apex's response to USEPA Comment No. 4, the correspondence will be revised to include a background section that will provide information related to the site setting. Information related to the remediation goals, performance metrics, end-points, and measurement methodology will be provided in separate sections of the correspondence. Figures showing groundwater elevations and flow within the Main Sand stratum have been provided in previous documents and will be included in the forthcoming comprehensive conceptual site model. A reference to the most recent report incorporating these figures will be provided in the revised correspondence. The final sentence of this paragraph 3 on Page 10 will be revised as requested.

ORD/Battelle Comment No. 39 (Page 10, Paragraph 4): The framework implies that containment is achieved by pumping at the nearby refineries and that the drinking water well field is only operated intermittently and therefore does not influence groundwater flow. Although it is advantageous that these conditions impact groundwater flow in a manner that may inhibit migration of contaminated groundwater toward the drinking water supply wells, these conditions are not sufficient to ensure protection. The containment by pumping alternative should be further developed as part of the engineering alternatives analysis with a contingency provided for additional pumping should pumping rates/frequency in offsite locations change.

Apex Response to ORD/Battelle Comment No. 39: Please refer to Apex's response to ORD/Battelle Comment No. 37 regarding revisions to the remediation goal and performance metrics for Remedial Objective No. 5. Routine monitoring of the sentinel wells over the past 12 years has demonstrated that dissolved phase constituents attributed to releases from the facilities present in the northern portions of the Village of Hartford have not migrated to within 1,700 feet of the Village of Hartford production wells, which is well beyond the 1,000-foot maximum setback zone established by the Village of Hartford. The sentinel wells are located more than 700 feet laterally from the 1,000-foot maximum setback zone and screened more than 40 feet shallower than the Village of Hartford production wells. If dissolved phase constituents of concern were detected within the sentinel wells and hydraulic conditions indicated that flow was from the limits of the plume towards the Village of Hartford maximum setback zone (i.e., groundwater flow from the north to the south in the Main Sand stratum), then Apex may first propose to install new compliance wells at the limit of the 1,000-foot maximum setback zone and screened within the deeper portions of the Main Sand stratum. Numerous contingency measures (e.g. sparging, relocation of the Village production wells, etc.). may also be considered at such time, and would not be limited to hydraulic controls.

USEPA Comment No. 40 (Page 11, Paragraph 4, Sentences 2 through 5): While case studies can provide useful information for understanding general aspects of petroleum site conditions, determinations of well head protection and potential impacts to the nearby drinking wells at the Hartford site must be based on site-specific data only. This information appears out of place for a

methodology section. In addition, current site uncertainties need to be resolved, including, but not limited to, the controls on dissolved phase contamination of:

(1) complex site geologic heterogeneity;
(2) the significant influence of river stage on groundwater elevations and flow gradients;
(3) net influences of groundwater extraction from current and any future water supply wells;
(4) groundwater gradients under potential future ambient conditions; and
(5) estimates of remaining petroleum hydrocarbon mass and volume in LNAPL and dissolved phases.

Apex Response to USEPA Comment No. 40*:* The fourth paragraph on Page 11 will be revised to reflect that it is not anticipated that dissolved phase constituents would migrate within the Village of Hartford 1,000-foot maximum setback zone due to vertical and lateral attenuation. However, if stressed conditions (pumping) are present within the Main Sand stratum upon completion of the remedial alternatives, modeling of dissolved phase constituent flux under ambient (non-pumping) and stressed (pumping) conditions using MODFLOW, Bioscreen, or comparable software will be performed within a management area to demonstrate that Remedial Objective No. 5 has been achieved.

USEPA Comment No. 41 (Page 12, Paragraph 3): Modify the document as follows: "The frequency and location of monitoring may be reduced pending:

(1) comprehensive plume delineation;
(2) contaminant fate and transport determination;
(3) final corrective action selection;
(4) development of remedial progress monitoring metrics;
(5) establishment of baseline site conditions for remedy progress monitoring; and
(6) periodic geostatistical evaluation of the remedial monitoring network and/or monitoring frequency to identify potential modifications and/or reductions in the network and monitoring requirements while sustaining effective remedy progress monitoring."

Apex Response to USEPA Comment No. 41*:* Apex will revise the sentence to including Bullets No. 2 through No. 6. Bullet No. 1 will not be included as Apex believes that the dissolved phase plume has been adequately characterized along the southern limits of the smear zone. In 2017, groundwater samples were collected from 12 monitoring wells and multipurpose monitoring points along the southern limits of the smear zone. These wells were spaced no more than 200 feet apart and adequately characterized the limits of the dissolved phase plume along the lateral limits of the smear zone.

ORD/Battelle Comment No. 41 (Page 12, Paragraph 3): Natural attenuation modeling also may be performed using software such as BIOSCREEN, or comparable to evaluate the minimum distance

between the source area and a compliance point to achieve the appropriate groundwater quality standard. MAROS is another useful statistical tool to assess dissolved-phase concentration trends and provide a line of evidence that the plume is not expanding. Time series data may be used to confirm that the plume is not expanding under pumping conditions.

Apex Response to ORD/Battelle Comment No. 41: Please refer to Apex's response to USEPA Comment No. 37.

Table 1. Draft Multiphase Remedy Framework Objectives, Goals, and Metrics Summary

USEPA Comment No. 42 (General): The table content should parallel that of the text, as revised per the above comments.

Apex Response to USEPA Comment No. 42: The table will be revised following concurrence of Apex's responses to the USEPA and Illinois EPA comments. The table will be included with the revised correspondence.

USEPA Comment No. 43 (Remediation Goal): Modify/revise as applicable per above comments.

Apex Response to USEPA Comment No. 43: The remediation goals will be revised following concurrence of Apex's responses to the Agencies comments. The table will be included with the revised correspondence.

USEPA Comment No. 44 (Performance Metric): Modify/revise as applicable per above comments. Include quantitative value of metric as applicable. For example, specific federal or state regulatory criteria for dissolved phase constituents.

Apex Response to USEPA Comment No. 44: The performance metrics will be revised following concurrence of Apex's responses to the Agencies comments. The table will be included with the revised correspondence. Please see Apex's response to USEPA Comment No. 45 regarding revisions to the performance metrics and end-points.

USEPA Comment No. 45 (End Point): Clarify how End Points differ from Performance Metrics. Include use of End Points in the text, as applicable.

Apex Response to USEPA Comment No. 45: As defined within the ITRC guidance titled *Evaluating LNAPL Remedial Technologies for Achieving Project Goals* (2009), a performance metric represents a measurable characteristic used to demonstrate progress toward achieving a

remedial goal. Ideally, each performance metric has a predetermined value that describes when a remedial alternative has reached the limits of beneficial application, which is defined as the end-point for the remedial goal." A discussion of end-points will be added to the revised correspondence.

USEPA Comment No. 46 (Measurement Methodology): Modify/revise as applicable per above comments.

Apex Response to USEPA Comment No. 46: The measurement methodology for each performance metric will be revised following concurrence of Apex's responses to the Agencies comments. The table will be included with the revised correspondence.

ILLINOIS EPA COMMENTS

Illinois EPA Comment No. 1a: While proposed performance metrics of LNAPL transmissivity (T_n) ranges between 0.1 to 0.8 ft^2 per day and LNAPL saturation below 10% measures may be adequate to determine LNAPL is no longer recoverable via hydraulic methods, remaining LNAPL is still considered a source that may continue to affect soil, soil gas, and groundwater. Therefore, LNAPL cannot be considered removed to the maximum extent practicable in accordance with 35 Ill. Adm. Code 742.920, Impractical Remediation Demonstration, without meeting multiple lines of evidence. Prior to closure of groundwater, Apex must demonstrate the soil and vapor aspects have been satisfied, and the LNAPL is no longer contributing to the dissolved phase groundwater plume. Potential lines of evidence for a demonstration that LNAPL has been removed to the extent practicable are provided below:

- Site-specific information;
- The facility has received approval from Illinois EPA that all soil issues have been addressed;
- Multiple remediation efforts are no longer removing LNAPL;
- No vapor issues;
- Apparent LNAPL thickness in monitoring wells have decreased during remediation efforts;
- The area of residual LNAPL is defined by the current monitoring well network;
- The spatial orientation of the residual LNAPL appears to be stable;
- The residual LNAPL is delineated within a small area and within the site boundary;
- The remaining LNAPL does not contribute to dissolve phase as indicated by multiple groundwater monitoring events;
- There are no exceedances of applicable Groundwater Quality Standards in monitoring wells indicated in regular groundwater monitoring events; and
- LNAPL Transmissivity Values (between 0.1 and 0.8 ft^2/day).

Apex Response to Illinois EPA Comment No. 1a: While Apex is not proposing to remove LNAPL to the maximum extent practical nor is it envisioned that Apex will be requesting an Impractical Remediation Determination as outlined within the Illinois EPA Tiered Approach to Corrective Action Objectives (35 Illinois Admin. Code Part 742), the criteria listed in the bullets will be addressed via the RCRA corrective action process at the Hartford Site. Several of these criteria (e.g., "the facility has received approval from Illinois EPA that all soil issues have been addressed", "no vapor issues", "there are no exceedances of applicable Groundwater Quality Standards in monitoring wells indicated in regular groundwater monitoring events", etc.) have been identified as remedial objectives, remediation goals, and performance metrics by the USEPA and Apex. In addition, site specific end-points and measurement methods have been identified that will be used to demonstrate that the objectives, goals, and metrics have been achieved prior to Apex requesting a corrective action completion determination within a remedial management area. Although it is recognized that many of these end-points are not identical to the end-points provided within the Illinois EPA Tiered Approach to Corrective Action Objectives (35 Illinois Admin. Code Part 742), they serve as an indicator that the remedial objectives, remediation goals, and performance metrics have been achieved. It is important that the USEPA and Illinois EPA reach concurrence with Apex regarding the proposed remedial objectives, remediation goals, performance metrics, and end-points prior to beginning the process of evaluating remedial alternatives within each management area. The selection of appropriate alternatives within a management area will be dependent on an understanding of the end-point for the selected remedial technology.

Illinois EPA Comment No. 1b: Although exceedances above applicable 35 Ill. Adm. Code Part 620 groundwater quality standards would typically require a Groundwater Management Zone (GMZ) be established, this site is not required to have a GMZ. Regardless, Apex must conduct routine groundwater monitoring at an adequate number of monitoring points to delineate the extent of groundwater contamination to verify concentrations in groundwater and effectiveness of corrective action, and that monitoring must continue until approved otherwise. Similarly, an adequate well network must be monitored to delineate the area of mobile and residual LNAPL.

Apex Response to Illinois EPA Comment No. 1b: Apex currently conducts fluid level gauging activities within approximately 375 monitoring locations on a quarterly basis to delimit mobile and residual LNAPL across the Hartford Site. In addition, Apex currently monitors approximately 63 of the locations on a more frequent basis (approximately monthly) to determine when representative groundwater samples can be collected, avoiding potentially biased analytical results as described in Apex's response to USEPA Comment No. 33. In 2017, groundwater samples were collected from approximately 40 locations along the lateral limits of the dissolved phase plume, as well as within the smear zone limits to delineate the extent of dissolved phase constituents of concern including benzene, toluene, ethylbenzene, xylenes, MTBE, arsenic, and

lead. In addition, groundwater samples were collected from approximately ten monitoring locations for natural smear zone depletion indicators within the saturated zone.

Illinois EPA Comment No. 1c: The Illinois EPA cannot concur with the proposed approach for Apex to maintain hydraulic control of the groundwater gradient, or routine groundwater sampling of the sentinel wells by Apex. Instead, Apex must maintain hydraulic control (or some other corrective measure for groundwater approved by the USEPA and Illinois EPA), and conduct routine groundwater sampling of the sentinel wells. Apex has no control over the pumping wells they propose will maintain control of the groundwater gradient, nor do they have any control over reductions in pumping by surrounding properties; therefore, the other pumping operations cannot be considered an Apex corrective measure. In addition, Apex has not proposed a contingency measure if gradient is not maintained or sentinel wells show contamination (see Comment 1d below).

Apex Response to Illinois EPA Comment No. 1c: Routine monitoring of the sentinel wells over the past 12 years has demonstrated that dissolved phase constituents attributed to releases from the facilities present in the northern portions of the Village of Hartford have not migrated to within 1,700 feet of the Village of Hartford production wells, which is well beyond the 1,000-foot maximum setback zone established by the Village of Hartford. The sentinel wells are located more than 700 feet laterally from the 1,000-foot maximum setback zone and screened more than 40 feet shallower than the Village of Hartford production wells. If dissolved phase constituents of concern were detected within the sentinel wells and hydraulic conditions indicated that flow was from the limits of the plume towards the Village of Hartford maximum setback zone (i.e., groundwater flow from the north to the south in the Main Sand stratum), then Apex may first propose to install new compliance wells at the limit of the 1,000-foot maximum setback zone and screened within the deeper portions of the Main Sand stratum. Numerous contingency measures (e.g. sparging, relocation of the Village production wells, etc.). may also be considered at such time, and would not be limited to hydraulic controls.

Illinois EPA Comment No. 1d: The framework lacks contingency measures for the proposed remedial objectives. The Illinois EPA considers contingency measures to be a necessary part of the framework; therefore, contingency measures must be submitted as additional information within XX days.

Apex Response to Illinois EPA Comment No. 1d: Please refer to Apex's response to Illinois EPA Comment No. 1c.

Illinois EPA Comment No. 2: Apex states groundwater present in the shallow perched hydrostratigraphic units (i.e., North Olive and Rand Strata) is not a viable potable resource and they will evaluate the pathway with 35 Ill. Adm. Code Part 742. The exposure route evaluation requirements are outlined in 35 Ill. Adm. Code 742, Subpart C, and the groundwater ingestion

exposure route in 742.320. Below are the requirements listed in 35 Ill. Adm. Code 742.320, followed by Illinois EPA Comments to each item:

Apex Response to Illinois EPA Comment No. 2: As discussed in Apex's response to USEPA Comment No. 26, it is understood that the migration of perched groundwater can lead to dissolved phase flux from the overlying shallow units (North Olive and Rand strata) into the deeper hydrostratigraphic units (Main Sand stratum). However, there are several lines of evidence including evaluation of upward vertical gradients within co-located monitoring wells screened across the Main Sand stratum and orders of magnitude differences in dissolved phase concentrations measured in the shallow perched units compared to the Main Sand stratum that would indicate that petroleum related constituents are migrating from the Main Sand stratum into the perched hydrostratigraphic units. Within the draft correspondence, Apex proposed that risk based end-points would be developed to demonstrate that Remediation Goal No. 2 listed under Remedial Objectives No. 2 and No. 4 for the shallow perched units, assuming that the groundwater in the perched units was "not viable as a potable resource". As agreed to during the meeting on September 12, 2017, the end-point will be revised to state that an evaluation of the dissolved phase groundwater remediation objectives will be conducted within each groundwater management area in accordance with the Illinois EPA Tiered Approach to Corrective Action Objectives (35 Illinois Admin. Code Part 742) for the shallow perched hydrostratigraphic units. This evaluation will consider the pathway for dissolved phase migration, potential routes of exposure including direct ingestion, and determination of risk based concentration limits for each remedial management area.

Illinois EPA Comment No. 2a: The requirements of Sections 742.300 and 742.305 are met. This essentially requires the site be characterized, no soil attenuation capacities be exceeded, and the extent of contamination be delineated. As an alternative to excluding the exposure route through 742.320, they may choose to meet the requirements of 742.925 for the groundwater ingestion exposure route.

Apex Response to Illinois EPA Comment No. 2a: Since 2004, the distribution of petroleum related constituents present in soil, groundwater, and LNAPL have been well characterized at the Hartford Site via the following activities performed since 2004:

- Structures monitored: 185
- Sub-slab soil vapor monitoring probes installed: 688
- SVE wells installed: 145
- Groundwater monitoring wells installed (any well that is 1-inch in diameter or greater): 398
- Soil vapor monitoring locations installed (any location that is less than 1-inch in diameter): 282
- Laser induced fluorescence borings installed: 154

- Cone penetration testing borings installed: 130
- Groundwater samples collected: 1,011

In addition, fluid levels, sub-slab soil vapor, indoor air, and soil vapor samples are currently collected on at least a quarterly basis from an expanded monitoring network to assess changes in the distribution of LNAPL, dissolved phase, and vapor phase conditions beneath the Hartford Site.

An end-point requiring that "no soil attenuation capacities be exceeded" has not been proposed within the correspondence or table. Please refer to Apex's response to Illinois EPA Comment No. 1a regarding the proposed objectives, goals, and metrics.

Illinois EPA Comment No. 2b: The corrective action measures have been completed to remove any free product to the maximum extent practicable. See Comment 1 above.

Apex Response to Illinois EPA Comment No. 2b: Please refer to Apex's response to Illinois EPA Comment 1a.

Illinois EPA Comment No. 2c: The source of the release is not located within the minimum or designated maximum setback zone or within a regulated recharge area of a potable water supply well. The Village of Hartford maintains 2 groundwater wells (wells No. 3 and 4 are active, while No. 1 and 2 are abandoned), not 4 as stated on Page 10 of the submittal, for their public water supply. Apex states the extent of the estimated plume is within 600 feet of the public water supply wells. It is unclear to this reviewer whether extent of the plume is within 600 feet of the actual wells or the setback zone. Furthermore, Apex makes no mention of the 1000-foot setback zone established by the Village of Hartford as the designated maximum setback zone, which is greater than the minimum setback zone of 400 feet. No figures were provided depicting the extent of contamination, etc. If the contamination is measured or modeled to be within the setback zone of the water supply wells, the demonstration will not meet the requirements of 742.320. A demonstration through 742.925 under the Tier 3 framework may be possible.

Apex Response to Illinois EPA Comment No. 2c: As discussed in Apex's response to USEPA Comment No. 35, groundwater within the deep portions of the Main Sand stratum are utilized as a drinking water resource, more than 1,700 feet (well beyond the 1,000-foot maximum setback zone) to the southwest of the delimited extent of petroleum hydrocarbons attributed to historical releases from the refineries and petroleum storage facilities." The edge of the dissolved phase plume is more than 700 feet down-gradient from the maximum setback zone. Figures showing the location of the Village of Hartford production well, maximum setback zone, and dissolved phase plume extent will be provided with the revised correspondence.

Illinois EPA Comment No. 2d: As demonstrated in accordance with Section 742.1015, for any area within the measured and modeled extent of groundwater contamination above what would otherwise be the applicable Tier 1 groundwater remediation objectives, an ordinance adopted by a unit of local government is in place that effectively prohibits the installation of potable water supply wells (and the use of such wells). There is an existing Groundwater Ordinance for Hartford, No. 2010-0-225 (which does not require a Memorandum of Understanding (MOU) with the Illinois EPA according to the Illinois EPA website listing of the ordinance)) that is limited in extent. Specifically, Ordinance No. 2010-0-225 encompasses the Village property north of Hawthorne Avenue and extending northerly there from to the north, east, and west boundaries of the Village. This reviewer does not know whether the plume extends south of Hawthorne and would require a different or modified Groundwater Ordinance be established.

Apex Response to Illinois EPA Comment No. 2d: Dissolved phase petroleum hydrocarbons do not extend south of Hawthorne Avenue and the existing Groundwater Ordinance for Hartford (No. 2010-0-225) encompasses the entirety of the smear zone and dissolved phase plume beneath the Hartford Site. The boundaries of the existing Groundwater Ordinance for Hartford (No. 2010-0-225) will be included on the figure that is provided with the revised correspondence.

Illinois EPA Comment No. 2e: As demonstrated using Equation R26, in Appendix C, Table C, in accordance with Section 742.810, the concentration of any contaminant of concern in groundwater within the minimum or designated maximum setback zone of an existing potable water supply well will meet the applicable Tier 1 groundwater remediation objective; and See comments to 2c above.

Apex Response to Illinois EPA Comment No. 2e: Please refer to Apex's response to Illinois EPA Comment No. 2c.

Illinois EPA Comment No. 2f: As demonstrated using Equation R26, in Appendix C, Table C, in accordance with Section 742.810, the concentration of any contaminant of concern in groundwater discharging into a surface water will meet the applicable surface water quality standard under 35 Ill. Adm. Code 302. Any surface water must be considered, included drainage ditches, creeks, the Mississippi River, etc.

Apex Response to Illinois EPA Comment No. 2f: There is not any evidence of groundwater discharging to surface water within the limits of the LNAPL smear zone and dissolved phase plume beneath the Hartford Site and therefore this pathway was not considered within the draft correspondence or table.

Apex Response to Illinois EPA Comment No. 3: These comments do not address the soil, soil vapor, or indoor air pathway other than with respect to groundwater. The RCRA Unit will address the soil, soil vapor, and indoor air pathway.

Apex Response to Illinois EPA Comment No. 3: Apex has not received any additional comments from the Illinois EPA as of the date of this letter.

As discussed during the meeting on September 12, 2017 with Apex, USEPA, Illinois EPA, and their technical contractors, Apex will submit a revised correspondence including the modifications to the remedial objectives, remediation goals, and performance metrics upon reaching concurrence with the USEPA and Illinois EPA regarding each of their comments and Apex's responses included herein. If you have any questions, please contact Paul Michalski at (513) 430-1766.

Sincerely,
212 Environmental Consulting, LLC

Paul Michalski, P.G.
Senior Hydrogeologist

cc: Jordy Federko, Apex Oil Company, Inc.
Tom Miller, Illinois Environmental Protection Agency